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Research Report 1542

Tank Platoon Training Using the Precision Range Integrated Maneuver Exercise (PRIME) System as Perceived by Company Commanders

Ronald E. Kraemer and Milton E. Koger
U.S. Army Research Institute

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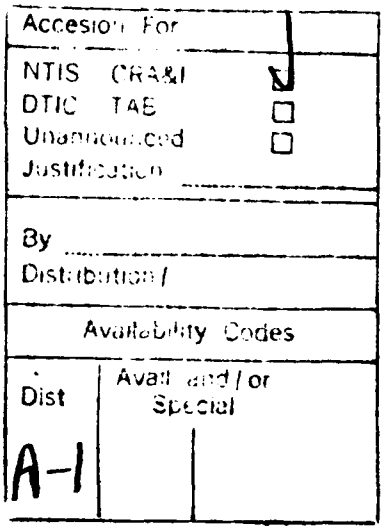

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This report presents the results of interviews on the use of the Precision Range Integrated Maneuver Exercise (PRIME) system. Eight tank company commanders were interviewed during the user test conducted by the Test and Experimentation Command (TEXCOM) (1 April-5 May 1989). Each commander was asked the following three questions: (a) which tasks from the Mission Essential Task List (METL) can be trained using PRIME, (b) what changes or enhancements are needed to improve PRIME, and (c) where can PRIME be used in the unit's overall training strategy. Commanders stated that PRIME would support eight of nine platoon tactical operations either on the range or in conjunction with other tactical operations being performed using PRIME. Commanders wanted the following: (a) a reliable, functional system, (b) training on the system, (c) unit training packages, (d) prepared and proofed scenarios, (e) summarized feedback, (f) assistance in preparing other action reviews (AARs), and (g) the time and mileage to conduct training on the site. The commanders indicated that PRIME could be used (a) as a diagnostic tool to identify individual, crew, and platoon

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gunnery and tactical training needs; (b) for training both tank gunnery and platoon tactics; and (c) as an evaluation tool whereby performance "gates" can be established and met before live fire exercises. (SDW)

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Training and Simulation

FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) Field Unit at Fort Knox is responsible for research on tank gunnery proficiency in Armor weapon systems. The objective of the work unit is to develop methods for delineating skill requirements and relevant performance measures to support training strategies integrating families of part-task gunnery devices. This particular research investigated the perceptions of III Corps company commanders who trained tank platoons using the Precision Range Integrated Maneuver Exercise (PRIME) located at Fort Hood. Most tank platoons practiced battle runs using PRIME to prepare for qualification on Tank Combat Table XII. This paper reports the results of interviews conducted with the tank company commanders to determine the following: (a) which tasks from the Mission Essential Task List (METL) can be trained using PRIME, (b) what changes or enhancements are needed (given its present capabilities) to improve PRIME, and (c) where can PRIME be used (given its potential capabilities) in the unit's overall training strategy.

The ARI research effort was prompted by a request from the Deputy Program Manager for Training Devices (PM TRADE), together with a request for assistance by the Directorate of Training and Doctrine (DOTD), U.S. Army Armor School (USAARMS).

This paper is one of three reports being prepared on PRIME by the ARI Field Unit and the Human Resources Research Organization (HumRRO). The research results have been briefed to PM TRADE and USAARMS. The results will be used to supplement information gathered by the U.S. Army Training and Doctrine (TRADOC), Test and Experimentation Command (TEXCOM) during the test agency's customer test of PRIME. The results also will be of interest to the U.S. Army Infantry School (USAIS) and U.S. Army Europe (USAREUR) that are scheduled to receive PRIME systems.

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Technical Director

TANK PLATOON TRAINING USING THE PRECISION RANGE INTEGRATED MANEUVER EXERCISE (PRIME) SYSTEM AS PERCEIVED BY COMPANY COMMANDERS

EXECUTIVE SUMMARY

Requirement:

The purpose of this research was to collect and analyze interview data concerning the use of the Precision Range Integrated Maneuver Exercise (PRIME) system as perceived by tank company commanders. The specific objectives of the research were to determine the following: (a) which tasks from the Mission Essential Task List (METL) can be trained using PRIME, (b) what changes or enhancements are needed (given its present capabilities) to improve PRIME, and (c) where can PRIME be used (given its potential capabilities) in the unit's overall training strategy.

Procedure:

Interviews were conducted with eight tank company commanders during and after the first two phases of the U.S. Army Training and Doctrine Command (TRADOC) Test and Experimentation Command (TEXCOM) customer test. Informal interviews were also conducted during this period with personnel from division collective training (G-3), battalion commanders, PRIME range personnel, and soldiers undergoing training at the PRIME site.

Findings:

Based on analysis and summary of tank company commander interviews, it appears that the two critical wartime missions of all armor and cavalry unit tank platoons (attack and defend) and eight of the nine tactical operations which support those missions can be trained solely or in conjunction with PRIME. As one tank company commander reported, "I went to PRIME, looked and listened, and found out there were things we were not doing and needed to fix...It showed me things that I couldn't have found out any other way, no matter what I could have done." In terms of changes or enhancements needed to improve PRIME, the commanders indicated they needed the following: (a) a reliable, functional system; (b) training on the system; (c) unit training packages; (d) prepared, proofed scenarios; (e) summarized feedback; (f) assistance in preparing after-action reviews (AARs); and (g) the time and mileage to train. In terms of where PRIME could be integrated in the unit's overall training strategy, the commanders indicated that PRIME could be used: (a) as a diagnostic tool to identify individual, crew, and platoon gunnery and

tactical deficiencies; (b) for training tank platoon gunnery and tactics, and (c) as an evaluation tool whereby performance "gates" can be established as prerequisites to live fire.

Utilization of Findings:

The results of this research provide indications about the current and potential uses of PRIME in training tank platoon gunnery and tactics, system needs and enhancements, and PRIME's integration in the overall training strategy for tank and mechanized infantry companies. As such, the research findings provide PM TRADE with important information that can be used in conjunction with the results of the TEXCOM customer test for determining procurement of additional PRIME sets for delivery to additional locations.

TANK PLATOON TRAINING USING THE PRECISION RANGE INTEGRATED MANEUVER EXERCISE (PRIME) SYSTEM AS PERCEIVED BY TANK COMPANY COMMANDERS

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TANK PLATOON TRAINING USING THE PRECISION RANGE INTEGRATED MANEUVER EXERCISE (PRIME) SYSTEM AS PERCEIVED BY COMPANY COMMANDERS

Introduction

Interviews were conducted by research personnel from the U.S. Army Research Institute (ARI) Field Unit at Fort Knox, Kentucky with tank company commanders from the U.S. Army III Corps, Fort Hood, Texas. The interviews were conducted to obtain company commander perceptions of tank platoon training using the Precision Range Integrated Maneuver Exercise (PRIME)[1] system capabilities. Tank platoon training at the PRIME site was conducted as part of the U.S. Army Training and Doctrine Command (TRADOC) Test and Experimentation Command (TEXCOM) customer test of PRIME. Seven of the eight commanders interviewed trained their tank platoons during Phase I of the TEXCOM test prior to live firing M1 Tank Combat Table XII for qualification. The remaining commander interviewed was involved in the support of the PRIME site during Phase I and trained his tank platoons during Phase II.

The company commander interviews were conducted as part of a technical advisory service (TAS) requested of the ARI Field Unit at Fort Knox by the Deputy Program Manager for Training Devices (PM TRADE) to answer three basic questions: (a) which tasks from the Mission Essential Task List (METL) can be trained using PRIME, (b) what changes or enhancements are needed (given its present capabilities) to improve PRIME, and (c) where can PRIME be used (given its potential capabilities) in the unit's overall training strategy.

The purpose of this report is to provide PM TRADE with the information obtained during the interviews. A secondary purpose is to provide ancillary information obtained during the interviews about the development, integration, and potential training benefits of PRIME as currently perceived and implemented at Fort Hood.

Background

Development of PRIME

Based upon unit training needed to meet the III Corps training mission (August, 1987), III Corps and PM TRADE jointly developed a training device to focus on individual/crew weapons qualification and platoon/company level tactical training for armor and mechanized infantry units. In cooperation with TEXCOM, a commercial contract was initiated to begin work on the Fort

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[1]The acronym PRIME has different meanings. Initially, PRIME was an acronym peculiar to Fort Hood for Phantom Run Instrumented MILES Enhanced. MILES is an acronym for Multiple Integrated Laser Engagement System, a system that uses laser beams to simulate weapon firing. In a Memorandum for Record (30 Jan 1989) of a meeting on PRIME called by the U.S. Army Training Support Center (USATSC) and held at PM TRADE, USATSC reported that in a briefing of the Close Combat Training Strategy to GEN Vouno, Chief of Staff, U.S. Army, on 2 Dec 1988, PRIME was renamed to Precision Range Integrated Maneuver Exercise. Motivating the redefinition of the acronym was the requirement for both a laser and live fire range system.

Hood PRIME. Headquarters (HQ) TRADOC designated TEXCOM as the test agency and the Combined Arms Center (CAC), Combined Arms Training Activity (CATA) as the initial proponent (May, 1988). The Fort Hood PRIME was accepted from the contractor by PM TRADE (September, 1988). Shortly thereafter, CATA began staffing a concept paper on the need for a training device. Because all of the PRIME components were off-the-shelf items readily available to the Army, III Corps began submitting a commercial training device requirement (CTDR) to PM TRADE.

The Commanding General (CG) TRADOC requested that a proponent be named for PRIME and that three additional PRIME systems be procured in calender year (CY) 89. These systems were to be installed at range facilities available to the U.S. Army Armor School (USAARMS), U.S. Army Infantry School (USAIS), and U.S. Army Europe (USAREUR) (November, 1988). The CG USAARMS accepted the proponency for PRIME and agreed to coordinate all development activities with the USAIS.

The following acquisition strategy was agreed upon by III Corps, PM TRADE, USAARMS, USAIS, TEXCOM, and the Army wide Training Support Center (ATSC) (January, 1989):

1. Using the Fort Hood PRIME CTDR and recommended Engineering Change Proposals (ECPs) and Block Modifications (BLK Mods) (See Appendix A), USAARMS and USAIS will develop a worldwide CTDR for fielding at Fort Knox, Fort Benning, and Major Training Area (MTA)/Combat Maneuver Training Center (CMTC) in USAREUR in that order (dependent on site survey/frequency survey).

2. TEXCOM and PM TRADE will conduct a customer test at Fort Hood in the Apr-May 1989 time frame. USAARMS and USAIS will provide input to the test design. Test results will drive a Jun 89 contract decision for the three additional locations. USAARMS and USAIS will advise TRADOC and PM TRADE of their decision.

3. PM TRADE will contract for three additional PRIME sets (dependent on customer test results/site surveys) for delivery starting in Dec 89. These additional PRIME sets will include as many of the ECPs and BLK Mods as possible. Availability of technology will determine if all requested capabilities are included or will be later preplanned product improvement (P3I) items.

4. USAARMS, USAIS and the CMTC will try out their PRIMEs to help develop training strategies and identify additional requirements.

5. Once all the requested capabilities (defined as the objective system) are procured, a Training Device Study (TDS) supported by a Force Development Test and Experimentation (FDT&E) will be conducted and an in-process review (IPR) held prior to additional worldwide fielding.

A Memorandum of Agreement (MOA) was signed between PM TRADE and TEXCOM delineating responsibilities, procedures and funding for the conduct of the PRIME customer test (March, 1989). TEXCOM agreed to conduct the customer test at Fort Hood during the 1 April-15 May 1989 time frame, and PM TRADE agreed to coordinate issues with the USAARMS and USAIS and fund the test. Prior to 1 June 1989, TEXCOM would brief PM TRADE on the results of the test and submit a Letter Report to PM TRADE in July 1989.

TEXCOM Customer Test

The TEXCOM customer test (April, 1989) was considered an informal test designed to investigate the capabilities of the Fort Hood PRIME. Although no firm issues and criteria, measures of performance, or standards were specified, the customer test addressed four issues: (a) does PRIME satisfy the operation requirements as stated in the CTDR, (b) does PRIME support tactical training for mechanized infantry and armor platoons, (c) what resources are required for PRIME, and (d) is PRIME transportable.

As described in the TEXCOM test plan, the customer test was to be conducted in three phases: gunnery, test, and movement. The gunnery phase (Phase I) was to be conducted on a non-interference basis 1-15 April 1989. Player units (mechanized infantry platoon, tank platoons) who were currently going through gunnery training would train on PRIME. Tank platoons would train on PRIME for one day as a substitute for Table XI following Table VIII and then complete Table XII.

The test phase (Phase II) was to be conducted 24 April-3 May 1989 with TEXCOM controlling all aspects of the test. Mechanized infantry platoons in M2/3 Bradley fighting vehicles were to be tested 24-27 April followed by tank platoons during the period 30 April-3 May. The two day interval between tests was to be used to remove the instrumentation installed on the Bradleys, check instrumentation installed on M1 Abrams tanks, reset targets as needed, and set the range control computer for tank platoon operation. As designed, player units were to conduct four day runs and three night runs each day using PRIME. Objective test data were to be collected on player unit actions, equipment operation, and resource requirements. Subjective data were to be collected on after-action reviews (AARs), user opinions, and test team observations.

The movement phase (Phase III) was to be conducted on 4-5 May 1989. The purpose of this phase was to determine if PRIME can be moved from one training area to another and whether operations can be reestablished in a reasonable period of time.

Description of PRIME

PRIME is a prototype training system being developed for procurement by PM TRADE for mechanized infantry and armor crew and platoon tactical engagement and gunnery training. As described in the III Corps working concept paper (November, 1988), PRIME is considered a technical enhancement to the capabilities provided by basic tank MILES, Laser Target Interface Device (LTID), Instrumented MILES (I-MILES), and Automatic Tank Target System (ATTS).

A PRIME prototype is currently installed on an existing 6.5 x 1.5 kilometer (km) range at Fort Hood that uses existing ATTS equipment, a modified LTID, and a new range control computer. The system enhancements are designed to provide event driven target activation based on (a) vehicle location, (b) target shoot back capabilities dependent on vehicle actions or time, and (c) target/vehicle event and data collection through a telemetry data link.

As shown in Figure 1, the PRIME System includes the following five subsystems: Command and Control, Thru-the-Sight Video (TSV), Targetry, Monitoring, and After-Action Review (AAR). Each of these five subsystems is

described in the following paragraphs. Capabilities for each subsystems are defined in the III Corps concept paper (November, 1988).

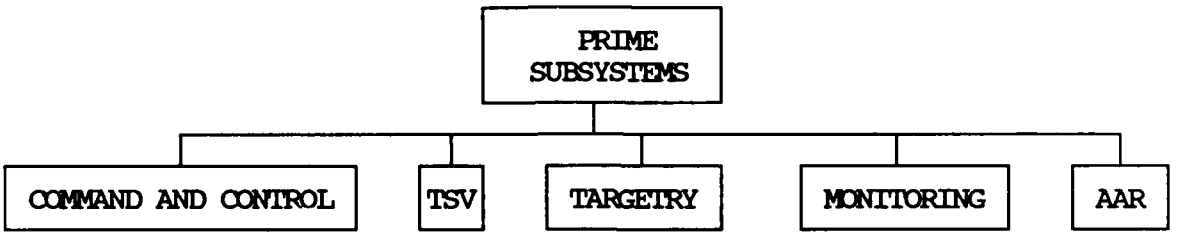

Figure 1. The five subsystems of PRIME

Command and control subsystem

The PRIME Command and Control subsystem, consists of three elements: Range Control Computer (RCC), Vehicle, and Target; each with several sub-elements. Briefly, the Command and Control subsystem integrates, controls, monitors and allows the RCC operator to interface with the PRIME Vehicle subsystem, PRIME Targetry subsystem, and the subelements of the PRIME Command and Control subsystem before, during, and after an exercise. The PRIME Command and Control subsystem elements and subelements are shown in Figure 2.

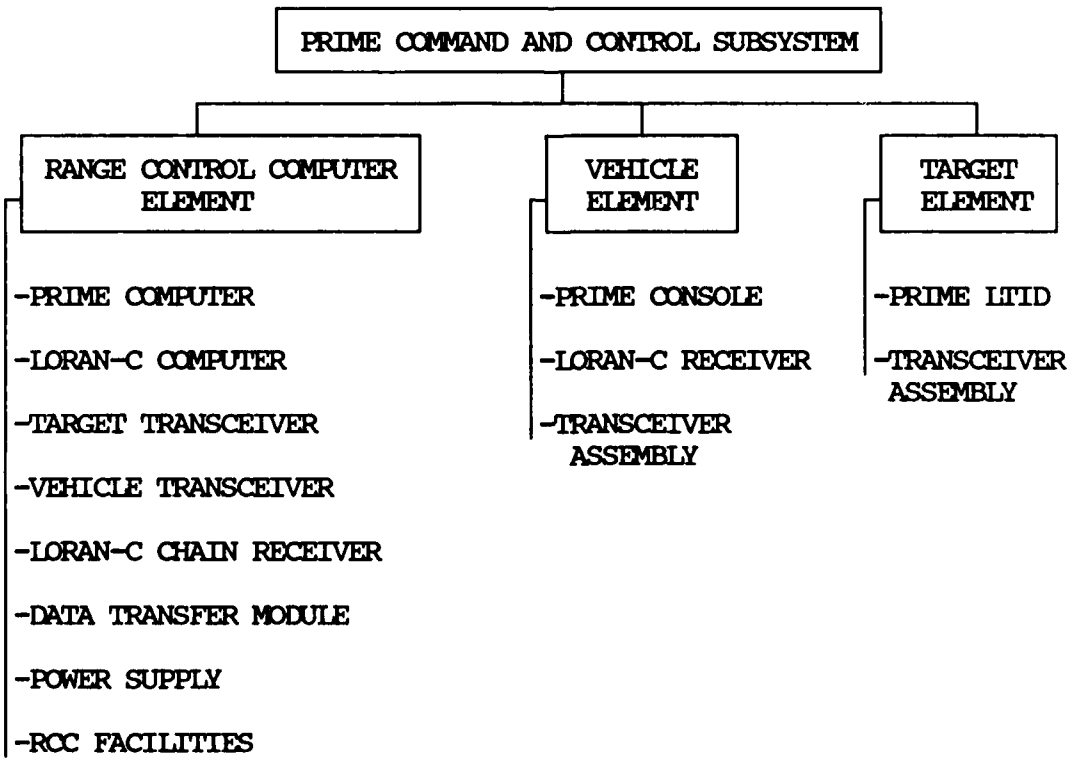

Figure 2. PRIME Command and Control Subsystem

Thru-sight video (TSV) subsystem

As part of a cooperative agreement between user, material developer, and tester, three different TSVs[2] were used during the customer test. The basic TSV used during Phase I of the test was the DBA product provided by TEXCOM. The DBA system consists of a light beamspliter and a basic recording module. The light beamspliter duplicates the optical transmission sighted through the gunners sight system for presentation to a video camera. The basic recording module records video data taken from the video camera and audio taken from the vehicle communication system. The two other TSVs used during Phase II of the customer test were provided by Texas Instruments and Atlantis.

Briefly, the TSV subsystem is designed to record in real time the gunner's sight picture, tracking technique, trigger pull and crew duties. When used in conjunction with other PRIME subsystems, TSV preserves a time-marked picture with an audio recording of the engagement sequence that allows analysis of the gunner engagement techniques and crew communications. With synchrony between TSV and PRIME time records, unit trainees can more easily review firing engagements and bring together information captured by TSV and the PRIME printout.

Targetry subsystem

The Targetry subsystem consists of target lifters, thermal blankets, generators, hostile fire simulators (Hoffman device), and target silhouettes that are currently available in the Army target device inventory for tank gunnery. The target assemblies are controlled by the PRIME Command and Control subsystem through a Laser Target Interface Device (LTID) to the ATTS mechanism. The PRIME LTID responds to the MILES codes from the vehicle firing system and activates the mechanism causing the target to fall. The ROC operator can also manually command the target to fall through the LTID. A target Transceiver Assembly connected to the PRIME LTID establishes a two way radio frequency data communications telemetry network to and from the PRIME command and control computer. Briefly, the PRIME Command and Control subsystem coordinates with the vehicle and target to provide enhanced engagement simulation, target control, and casualty assessment.

Monitoring subsystem

The Monitoring subsystem consists of fixed camera locations and video telemetry, and man-portable cameras with recorders. Fixed camera locations for video telemetry, which require determination of exact focal lengths and fields to tailor remote cameras to the range site, were not available for use at the PRIME range at Fort Hood. Fixed camera locations are intended to depict tactical use of terrain by the platoon from the target perspective during the exercise and for later use during the AAR. As a substitute for fixed camera locations, two man-portable cameras and recorders were used. Each soldier carried a hand-held video color camera with a satellite clock receiver to synchronize the time record on the video tape, and a video cassette recorder (VCR) housed in a fiberglass pack frame and pack. Briefly, the man-portable cameras and recorders allow the commander to analyze platoons in maneuver, observing the relationships among tanks and tanks to targets.

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[2]Army wide procurement of a TSV is ongoing at PM TRADE for FY 92-93

After-action review (AAR) subsystem

The after-action review (AAR) subsystem consists of video monitors to play TSV and down range camera tapes, a manual remote control system, video control, an AAR camera, and a AAR facility. The purpose of the AAR subsystem, when used in conjunction with the other four subsystems, is to provide effective and efficient feedback that can be used to instruct and remediate identified gunnery and tactical training deficiencies.

PRIME System Operation

Operation of the PRIME system is presented in the III Corps concept paper (November, 1988). As described, the PRIME Computer provides the operator with the interface to control and monitor the complete system. All commands are entered at the console and are automatically fed to the appropriate interface. Before training begins, the computer operator enters an engagement scenario into the computer database. This includes locating targets on the course for the exercise and entering the locations into the database. If necessary, the computer operator can assume manual control at any time during the exercise.

During the exercise, data is telemetered over a radio network through a range tower (located on the PRIME site) to and from the target assemblies and vehicle systems. This radio network uses a polling technique that allows vehicle position location updates at a variable rate. Vehicle position location is determined using a LORAN-C computer. The LORAN-C receiver picks up the pulsed radio signals from the Great Lakes and Gulf Coast LORAN chains. These signals are used to establish position location by analyzing radio pulse time differences between the RCC element LORAN-C chain receiver and the combat vehicle element LORAN-C receivers.

Correction factors for the vehicle position updates are provided by the LORAN-C reference station which is located by survey and treated the same as any other remote station in the radio network. All vehicle position locations are provided to the LORAN-C computer software as received and then simultaneously presented on the computer monitor for range operator information. Vehicle position locations are displayed on the screen in eight digit Universal Transverse Mercator (UTM) coordinates and are continuously updated as the vehicles move. The vehicle position locations are then used by the event driven scenario to control presentation of targets based upon the vehicle being in a drawn 50 meter grid or block Target Presentation Area (TPA). This information is then archived by the system for later use in scoring and analyzing the exercise.

The target assemblies are controlled by the PRIME system through a LTID to the ATTS mechanism. The PRIME LTID responds to the MILES code from the firing vehicle to cause the target to fall. The PRIME LTID captures all events concerning the target and telemeters that data to the RCC in the tower. Target shoot back is controlled through the telemetry system. This command can be given by the computer operator or through pre-established "rules of engagement" based upon time, or in response to firing by a vehicle.

Although the primary method of data transfer is over the various control networks, the PRIME LTID and PRIME computer record and store all events in on-board memory. In the event of failure, the exercise can continue in most

cases and use the Data Transfer Module to manually download event data to the PRIME computer after the exercise. As such, scoring and analysis for training evaluation can still be accomplished.

The TSV records video and audio in real time and presents a time tagged picture of the engagement sequence for gunner engagement techniques analysis. The TSV tapes, however, must be reviewed to determine individual, crew, and platoon strengths and weaknesses and then presented during the AAR. With TSV and PRIME being time synchronized, the time to find the firing engagements is reduced by using the engagement times on the PRIME printouts. Witmer (1989) provides a more detailed analysis of the measures of tactical gunnery performance that the TSV is capable of providing for purposes of an AAR.

In summary, PRIME is purported to have the potential to support M1 and M2/M3 MILES tactical and gunnery training for individual, crew, and unit (platoon, company). Specifically, it can support training in the areas of fire distribution, maneuver, command, control and communications (C^3), and target detection and acquisition. When upgraded to include the Tank Weapon Gunnery Simulator System/Precision Gunnery System (TWGSS/PGS) currently under development by PM TRADE, PRIME should support precision gunnery training.

Additional information describing PRIME is contained in a paper presented at the Research Symposium on Interactive Networked Simulation for Training (Kincaid, Sedlak, & Ozkaptan, 1989) and in a videotape produced by TEXCOM and PM TRADE (Kazmierski, 1988).

Tank Crew Proficiency Course (TCPC) Observations

Research personnel from ARI and the Human Resources Research Organization (HumRRO) conducted on-site observations, during the period 24-27 February 1989, of two tank companies who were conducting Tank Crew Proficiency Course (TCPC) exercises at the Fort Hood PRIME site. They also interviewed personnel assigned to the PRIME site and other agencies located at Fort Hood who were involved with PRIME.

Observations made during the on-site visit and their implications have been reported to PM TRADE. The major observations and their implications are summarized below:

1. Commanders who conducted TCPC exercises at the PRIME site did not know: (a) the tasks that can be adequately performed using PRIME, (b) the events that initiate task performance, and (c) how to assess or measure the adequacy of the performance.

2. Commanders who received PRIME computer printout data provided for after-action review (AAR) did not understand it or how to properly use it during the AAR.

3. Given the presence of target lifters and panels that lie on the ground and must be avoided when using PRIME, the platoon leader is not free to maneuver his platoon as he wishes. Since more targets are planned, the constraints upon the platoon leader will increase.

4. Although simulation training avoids the high cost associated with live fire, additional savings may be limited using PRIME due to the need for range control personnel, computer operators, maintenance personnel, and others commensurate with live fire ranges.

5. PRIME appeared to be well suited for tactical training, particularly for training command and control.

Present Research

The present research recognizes the major observations and implications resulting from the previous work accomplished for PM TRADE regarding PRIME. The primary purpose of this research was to help PM TRADE establish the validity of PRIME's application for Army wide use. This was accomplished by observing tank units using PRIME prior to Tank Combat Table XII qualification and interviewing company commanders to obtain their perceptions of PRIME for tank platoon training.

Method

Participants

Twenty-nine tank platoons from the U.S. Army III Corps, Fort Hood, Texas participated in the customer test of PRIME conducted by TEXCOM. Twenty-one platoons from eight companies participated during their division's tank gunnery cycle, and eight platoons from three companies participated during the tactical maneuver phase of their unit's gunnery training program. Eight of the 11 tank company commanders from these participating units were interviewed. Seven of the commanders interviewed trained their units at PRIME prior to live firing M1 Tank Combat Table XII for qualification. The remaining commander supported the other units' PRIME training and trained his platoons during the tactical maneuver phase of the TEXCOM test. Personnel characteristics of the participating units are described in the TEXCOM final report (Hayes, in preparation).

Procedure

Interviews were conducted individually with eight tank company commanders. Seven of these interviews were held shortly after each unit completed Tank Combat Table XII. The remaining interview was held following the unit's training on PRIME. These interviews were semi-structured. That is, commanders were asked three specific questions but were allowed to freely respond to other issues or concerns that related directly or indirectly to each of the three questions. Before conducting the interviews, commanders were told that the interview would take approximately 30 minutes and then asked if the interview could be audio-recorded for later analysis.

In conducting the interview, commanders were informed as to the purpose of the interview and then asked to address three major questions. They were told that the purpose of the interview was to provide PM TRADE with information about the current and potential uses of PRIME in training tank platoon gunnery and tactics, system needs and enhancements, and PRIME's integration in the overall training strategy for tank companies. The three specific questions that were asked were: (a) which tasks from the Mission Essential Task List (METL) can be trained using PRIME, (b) what changes or enhancements are

needed (given its present capabilities) to improve PRIME, and (c) where can PRIME be used (given its potential capabilities) in the unit's overall training strategy.

During the conduct of the commander interviews, the authors recognized a problem in identifying a single list for the platoon METL. The commanders were consistent in the identification of their battalion and company METLs, but inconsistent in their platoon METLS. Most of the commanders talked from prepared lists of battalion and company METLs. Some commanders took the company METL and discussed the ability of the platoon to do their portions. Others broke the company METL down to platoon and crew tasks for each mission or talked about platoon operations that could be performed within the company's METL. Additionally, commanders were not very consistent in the terminology they used to describe their platoon METL. This problem, as well as the fact that current doctrine does not have a place for the development of a platoon METL, is described in the following discussion of company missions, platoon battle tasks, and platoon operations.

Content Analysis

After closely examining the current literature on company missions, platoon battle tasks, and platoon operations, the authors decided to use the list of platoon operations (ARTEP-17-237-10-MTP, 1988) to categorize the commanders' responses into whether or not the operations could be trained on PRIME. Since no formal data collection instrument was used during the commander interviews, a separate data tabulation form was prepared to summarize the commanders' comments. This data form listed the nine operations that correspond to the battle tasks of a tank platoon and the following three training categories: (a) can be trained on the range using PRIME, (b) can be trained in conjunction with other operations being performed on the PRIME site, and (c) cannot be trained on the range or in conjunction with other operations being performed on the PRIME site. A copy of this data form is presented in Appendix B.

The authors listened to each of the audio tapes together and then independently wrote down what they considered responses to each of the three questions and major issues or concerns related to PRIME. During this process the authors replayed or stopped the tapes as often as necessary to record the data. After all the tapes were reviewed, the authors compared their individual lists and collectively summarized the data. All disagreements or identification of major issues not listed by one of the authors were resolved by replaying the tapes, discussing the commander's comments, and arriving at a mutually acceptable decision.

Results and Discussion

The results of the tank company commander interviews regarding PRIME are presented below by each of the three questions addressed during the interviews.

METL Tasks That Can Be Trained Using PRIME

All Active Component (AC) and Reserve Component (RC) Modification Table of Organization and Equipment (MTOE) and Table of Distribution and Allowances (TDA) organizations, from corps to company level, prepare METLs (FM 25-100,

1988). For the purpose of this report, the company METL is described with primary emphasis focused on the platoon battle tasks that support the company METL. The subordinate collective tasks for those battle tasks will be addressed in a subsequent report (Kraemer & Koger, in preparation).

Company missions

The tank and mechanized infantry company has seven critical wartime missions that will not change (ARTEP 71-1-MTP, 1988). These wartime missions are: (a) movement to contact, (b) attack, (c) raid, (d) ambush, (e) reconnaissance and security, (f) defend, and (g) retrograde.

The company's METL is based on the missions assigned to the company team by its battalion task force and developed by the company commander based on contingency missions assigned the company team. Thus, the METL may change from company to company based on missions assigned.

The company may develop additional tasks critical to its specific wartime missions that may not be included in the seven missions listed above (ARTEP 17-237-10-MTP, 1988). The collective tasks the company will focus on for training are then selected by the commander to support its ability to perform tasks in its METL. A representative copy of a company METL developed by one of the units that used PRIME is shown in Appendix C.

Platoon battle tasks

The Mission Training Plan for the Tank and Mechanized Battalion Task Force (ARTEP 71-2-MTP, 1988) defines a mission as "a primary task assigned to a unit" (p.2-1). The manual goes on to state that since missions are not standardized they are listed under the general category of type of "operation." Furthermore, each mission is related to a primary task and purpose, with numerous supporting tasks that must be accomplished in order to execute a mission. Thus, the MTPs have been organized to show the supporting critical tasks for each critical mission.

The Armor School has developed nine Situational Training Exercises (STXs) that support the platoon critical wartime missions. These nine STXs are listed in the Mission Training Plan (MTP) for the Tank Platoon (ARTEP 17-237-10-MTP, 1988). These STXs are also referred to as operations and correspond to the battle tasks of a platoon.

A battle task is a command group, staff, or subordinate organization mission essential task that is so critical that its accomplishment will determine the success of the next higher organization's mission essential task. Battle tasks are selected for each mission essential task in the METL. Thus, for each task in the company METL there will be battle tasks that a platoon must perform in order for the company to accomplish that task.

Based on commander comments in the interviews, the nine platoon tactical operations were placed in one of three categories: (a) can be trained on the range using PRIME, (b) can be trained in conjunction with other operations being performed on the PRIME site, and (c) cannot be trained on the range or in conjunction with other operations being performed on the PRIME site. The consensus among the company commanders' judgments of each operation is shown in Table 1.

Table 1

Tank Company Commander Judgments of Training Platoon Tactical Operations Using PRIME

Platoon Tactical Operations	Trained Using PRIME		
	Can	Conjunction	Cannot
Conduct a tactical road march		X	
Conduct a deliberate/hasty defense	X		
Conduct a passage of lines, rearward		X	
Conduct a passage of lines, forward		X	
Conduct a movement to contact	X		
Conduct a hasty attack	X		
Occupy an assembly area		X	
Conduct a deliberate attack	X		
Conduct resupply			X

As shown in the first column (see Table 1), the commanders indicated that four operations requiring maneuver and use of the weapons systems "can" be performed on the range portion of the PRIME site. However, they felt that scenarios and training packages needed to be developed and made available to them to adequately train these four operations. They also felt that changes to the PRIME targetry subsystem would have to be made in order to train the defensive operations. First of all, the current targetry is geared for offensive operations. Targets are presented when vehicles enter a target activation area. Secondly, there are not enough targets and they are not currently presented in an array to represent attacking forces likely to faced by a tank platoon.

As shown in the second column (see Table 1), the commanders indicated that four other operations can be trained in "conjunction" with PRIME. These operations can be trained on the PRIME site or on the way to the site, but do not have to be trained using the PRIME system. For example, the commanders indicated that a training package and scenario could be developed that made them conduct a passage of lines either before conducting a battle run or after completing a battle run as they moved off the range portion of the PRIME site. They also indicated that the platoon could be trained to occupy an assembly area when they moved onto the PRIME site. For the operation, conduct a road-march, several of the commanders felt that if a road course was laid out using the PRIME system, they could train this operation.

As shown in the last column (see Table 1), the commanders indicated that they "cannot" train the resupply operation using PRIME. They did indicate that some of the collective tasks involved in the resupply operation could be done in conjunction with the use of the site (e.g., refueling). However, they felt that the conditions under which these tasks could be performed in training using PRIME would be quite different from the way they would be performed in combat. Additionally, they felt that the number of collective tasks capable of being performed at the PRIME site would not be sufficient to adequately train the operation.

In summary, this initial attempt to identify the METL tasks that can be trained using PRIME is only a cursory examination of what platoon battle tasks may be trained. It does not indicate to what degree the operations can be performed using PRIME nor does it identify what platoon and crew collective tasks and individual tasks can be trained or to what degree they can be performed using PRIME.

A framework for conducting a more detailed analysis has already been developed (Drucker, Campshure, and Campbell, 1988). In their report, "An analysis of tank platoon operations and simulation on SIMNET," each behavioral component of a tank platoon operation was analyzed to determine: (a) whether or not the components could be performed on SIMNET, (b) whether all components of the element could be performed, (c) whether the stimuli and responses are the same in SIMNET as they are on the actual vehicle, (d) whether or not positive transfer would be expected between performance on the SIMNET and performance on the actual vehicle, and (e) whether or not performance of the element in SIMNET can be observed. This type of analysis could be performed for PRIME and verified by personnel who have actually used the instrumented equipment.

Changes or Enhancements Needed to Improve PRIME

The company commanders' responses are summarized and categorized below by each of the PRIME subsystems and nonsystem needs.

Command and control subsystem

Shoot-back capability. Commanders reported that they liked the shoot-back capability provided by PRIME, but indicated that the system needed to be "fixed." If a vehicle was killed there was "no argument that something wasn't done right." The light flashed on the tank and the computer printout showed that the vehicle was killed. However, the commanders expressed concerns about how and why the vehicles were killed. Comments were made that the tank commanders did not really understand the shoot-back capability and that they were not confident it worked correctly.

Many of the commanders also were concerned that their platoons were (a) not getting credit for good maneuver and use of terrain, and (b) not being penalized for poor maneuver and use of terrain. There were too many instances of tanks being killed when they were in a good hide or covered positions.

With respect to this issue, most of the commanders interviewed used PRIME before the first version of what is called the "jagged edge" was introduced into the system. Prior to the "jagged edge," all target presentations were based upon entry of a vehicle into a Target Presentation Area represented by a circle centered around the target with a definable radius. The "jagged edge" capability introduced before Phase II enabled the TPA to be defined by engagement areas. In discussions with PRIME range personnel, the areas are defined by 50 meter by 50 meter blocks and each block coded as either "kill" or "no kill" for each target. Although this allowed for better TPAs than before, it still did not meet the desires of the few commanders who used it. These commanders stated that the TPAs should be more precisely defined, especially for defensive engagements.

Event driven target presentation. Commanders indicated that they liked the capability of PRIME to present targets based upon events. They reported that the automatic target presentation allowed them to concentrate more on what the platoon was doing rather than having to remember to tell the tower to present targets and then wait for the target operator to lift them. However, the commanders were unsure of how the event driven target presentation worked. In other words, what caused the targets to be presented? How were the TPAs laid out? If a target was presented based upon one vehicle entering the TPA and was then killed, would the target be represented if another vehicle entered the area? Based on their experiences using PRIME, the targets would come up, go down, and then come up again in ways that sometimes seemed inappropriate.

To gain confidence in the system, the commanders expressed the need to know exactly how the system worked. They also commented that the engagement scenarios must be proofed to insure they work properly before being used for training. In other words, when targets are presented at PRIME they must be visible to tanks within the platoon. If the scenarios are not physically verified by someone in a tank, there may be targets presented that will not be visible to any tank in the platoon.

The commanders expressed additional problems with the defensive engagement scenarios. When a tank moved into the vicinity of its defensive position it often triggered the activation of targets. This did not allow the platoon leader to go through many of his necessary leader tasks. Company commanders who used PRIME at the end of Phase I indicated that these problems were at least partially solved when the RCC operator began to break down the larger defensive scenarios into several smaller scenarios. This allowed the platoon to occupy its defensive position and the platoon leader to accomplish his leader tasks before the scenario was started. Additionally, a modification is being made to allow a delay of target up, when a vehicle is occupying a defensive position, of up to 999 seconds (16.65 minutes) from the time the vehicle enters the TPA.

Vehicle identification code. Commanders commented that vehicles were shooting at targets, but the shots were not showing up on the computer printouts. They reported that after some platoon battle runs one or more vehicles were showing up on the computer printouts as not having fired a shot. Consequently, commanders started telling their tank commanders (TCs) to shoot. After the TCs protested that they were shooting, the commanders and TCs began reviewing the TSV tapes. The TSV tapes showed that the crews were engaging the targets. As a result of instances like this, commanders stated that their overall confidence in the computer printouts dropped.

After a special boresight panel was installed between Phase I and Phase II of the test, test personnel discovered that the vehicle code was not being transmitted by all vehicles. LORAL personnel tracked this problem to the PRIME LTID and corrected the problem. As mentioned earlier, the PRIME LTID responds to the MILES codes from the vehicle firing system and is used to cause the target to fall. Trials conducted by LORAL and TEXCOM personnel after Phase III of the customer test (5 May 89) have verified the correction.

Computer Printout. The consensus among the commanders was that the computer printouts had to be fixed! They reported that they felt completely overwhelmed by the data provided to them. There was simply too much data

being provided, and what was being provided was not in a usable format. As one commander put it, "the printouts are incomprehensible." What the commanders said they wanted was a summary sheet that showed: (a) when and which vehicles shot, (b) the targets they shot at and the results, (c) when and which targets shot back, and (d) the vehicles it shot at and the results.

The commanders also stated that the computer printouts contained inconsistencies. One printout showed one tank killing a target while another showed a different tank killed the target. Operators pointed out that on one printout the firing vehicle is obtained by querying the target subsystem. On another printout the vehicle subsystem is queried to obtain the firing vehicle. On the first printout, if the required information is not obtained from the target subsystem, the computer is told to assume that the first vehicle entering the TPA was the firing tank. As a result, if the first vehicle was not the firing vehicle, the two printouts showed different firing tanks. Resolution of the vehicle identification code problem should eliminate this problem.

Commanders also wanted the RCC to take the data available and use that data to provide them with succinct summaries of each engagement. They indicated that not all the information they needed was being collected. That is, some of the information had to be derived from other data collected. For example, elapsed engagement time would be derived from the time the target was presented and the time the vehicle fired.

In summary, the company commanders were enthused about the potential of being provided with objective data concerning the gunnery and tactical performance of their platoons. However, they wanted the computer printout data analyzed and put into a very compact, easy to use, and standardized format for their use during the AAR. Commanders also suggested that personnel from the TRADOC community review the requirements and develop standardized computer printout formats. A sample of what two commanders wanted on the computer printouts is presented in Appendix D.

Currently, the ARI Orlando Field Unit (Witmer, 1989) is working on computer printout formats. The ARI after-action review formats are shown in Appendix E.

Thru-sight video (TSV) subsystem

The commanders reported that they liked the TSV subsystem because it provided them with a record of both good and bad performance. As one commander stated, "TSV is the only way a commander can tell what a gunner is doing inside a tank and how the crew is interacting before, during and after an engagement." Commanders commented that during AARs the tank crews can observe their performance and that of other crews. With assistance, they can then relate their performance to platoon performance. Commanders also stated that they could use the TSV tapes as examples of how to do things correctly.

The most negative comment reported by the commanders about the TSV subsystem was that it took too much time to install. The consensus was that the time needed to install the TSV would require: (a) at least one day per company for installation and another day for removal, (b) hot-bedding of vehicles, or (c) permanent tanks being assigned to PRIME. Commanders

indicated that they would be willing to devote the two days for installation and removal provided sufficient time was allowed for using PRIME.

One commander commented that his company experienced an inordinate number of thermal sight failures during PRIME. In his opinion, the TSV or some other vehicle component may have been partially responsible.

Targetry subsystem

Commanders directed their comments in this area toward the targets and not the PRIME target element components, other than those already covered under the PRIME Command and Control subsystem.

Most commanders commented on the thermal characteristics of the target. Some reported that the low thermal difference was good because it was more challenging than the targets they would see on Table XII. Others reported that the low thermal difference presented too hard a task for their crews.

All of the commanders reported that one of the major problems faced by a platoon is target detection. They stated that their platoons did not acquire all the targets on PRIME or on Table XII. One commander made the point that one of his platoon was presented with 22 targets on Table XII, fired 28 rounds, hit 11 targets, but put a total of 23 holes in those 11 targets. According to the commander, the problem was not in hitting the targets they shot at, but finding all the targets. Like other commanders, he commented that the crews need additional training in target detection.

The commanders indicated that the ability to vary the thermal difference based upon the crew's ability may be helpful in training target detection. However, PRIME range personnel stated that with the 12 volt battery the current system uses, it is only capable of generating the power to heat the thermal panels to 2 degrees above ambient. To heat the panels more may require additional power capability or a power hook-up for the target.

Monitoring subsystem

The commanders reported that they liked the enemy perspective of how the platoon was maneuvering as provided by the downrange cameras. During the customer test there were two manpacked cameras located down range. Camera operators were enlisted personnel provided by the support unit who were trained and given instructions on what to record by range personnel. One camera was positioned on the hill just to the south of the defile. The other was located in the woods on the hill near battle position (BP) 2 or in the open area between the hill and the bridge site. The first camera covered the movement from the line of departure (LD) to the movement through the defile. The second camera picked up the movement through the defile and recorded the movement to BP 2.

The commanders commented that they wanted another down range camera to provide coverage of the platoon movement from BP 2 to BP 3. They also indicated experiencing problems with the quality of the recordings (e.g., too much scanning, zooming in and out, camera steadiness) and suggested the use of portable tripods and more operator training to eliminate the problem.

After-action review (AAR) subsystem

All of the commanders stated that they were impressed by the equipment and data provided to them for use during conduct of the AAR. They reported that the data collected by PRIME allowed them to examine and dissect each operation as well as some of the collective and individual tasks performed during the operation. However, they indicated that they were completely overwhelmed by the volume of data that had to be digested to give the AAR. This became particularly evident during Phase II of the customer test. For their first battle runs, commanders were using jeep top AARs rather than the system reports. On their second runs they went to the AAR facility, but paid little attention to the computer printouts. Commanders based their AARs on what they saw by following the platoon down range during the battle runs. They then used the TSV tapes to discuss the engagement and point out individual, crew and platoon performance strengths and weaknesses.

The commanders reported that they needed more instruction and assistance in using the AAR subsystem than what was provided by the support unit (see Appendix F, G). They indicated that they were not made fully aware of the capabilities of the subsystem or the data provided for use during the AAR. What the commanders said they wanted was more training on the subsystem and a knowledgeable person to assist them in preparing for the AAR. That person could help them analyze the data and point out any additional information that would be useful in training the platoons. The commanders stated, however, that they wanted to personally conduct the AAR.

Commanders also reported some difficulty in synchronizing the TSV tapes. Since each VCR had to be individually placed on a selected frame, they had to tell the crews to start the VCRs. However, this problem was not expressed by commanders when all the VCRs were repositioned near the front of the room and started simultaneously by a remote control device.

Commanders suggested that a range diagram showing vehicle and target locations and trigger points be developed and positioned at the front of the AAR facility. They wanted to use this diagram during the AAR to help cover the events that occurred in the scenario. They indicated that this diagram would be used to show each tank's sector of responsibility, the platoon's coverage of the assigned sector, individual crew scanning requirements, and the firing engagements. During Phase II, commanders used such a range diagram with overlays that was positioned at the front of the room.

Commanders also suggested improvements on the physical layout of the AAR facility. In its current configuration, the TSV monitors are positioned on separate tables and not visible to all the crews. Commanders suggested mounting the monitors at eye level and next to each other at the front of the room so that the battle run could be viewed from a platoon perspective. This was not tried out during the customer's test.

Nonsystem needs

Training for commanders. The commanders reported that they did not fully understand how to use PRIME when they arrived at the range. They stated that they received a general briefing on PRIME several months before, but what they wanted was specific training on how to use it for platoon training. This training they thought should be in enough detail so that they could fully

understand the pieces of data provided at the end of a battle run, and how to integrate these pieces of data into an effective AAR.

Training packages for units. The commanders reported that training on PRIME should be directed at accomplishing the specific training needs of the unit. They indicated that the PRIME site should have readily available training modules so that a using unit can put together a training package tailored to meet its particular training needs. These training modules should be scenario based and integrated with collective and individual training objectives that include tasks, conditions, and standards. They also indicated that they wanted to have the training package ahead of time to prepare their platoons for training at the PRIME site.

Battle run scenarios. The commanders suggested that platoon battle run scenarios be prepared for the training packages. They indicated that these scenarios should be based on platoon battle tasks and tailored by the unit's METL. Also, the scenarios developed should be entered into the range computer and proofed on the PRIME site before they are used by the units for training.

Hot-bedding tanks for PRIME. As one company commander stated, "The tanks let me down. Not the PRIME system." His second platoon was down to two operational tanks by the time it reached the line of departure. Because of the time required to change vehicle systems from nonoperational to operational tanks, he was able to complete only one day run.

Part of the problem was due to the number of PRIME vehicle elements available for the test. During the user test there were only four PRIME vehicle subsystems available for each type vehicle (M1 and M2/M3). Since vehicle subsystems are not interchangeable between type of vehicles (e.g., M1 to M2 or M2 to M1), whenever a vehicle went down because of a maintenance problem, the PRIME vehicle subsystem components had to be taken off that vehicle and installed on an operational vehicle. This process took approximately 30 to 90 minutes depending on personnel, whether the components had previously been installed on the vehicle, and if the mounting attachments were still installed. With additional vehicle subsystem components scheduled for the Fort Hood PRIME, range downtime problems created by vehicle maintenance should be reduced.

Use of PRIME in Overall Training Strategy

The company commanders identified three major uses of PRIME in the development of an overall training strategy. Each of these uses are described below.

Diagnostic tool

Commanders indicated that PRIME could be used early in the gunnery cycle as a diagnostic tool to identify both platoon and individual tank crewmember training strengths and weaknesses. What they envisioned was taking their unit to the PRIME site and conducting platoon battle run scenarios that allowed them to determine how well their personnel could perform both their platoon operations and supporting collective and individual tasks. Based on the feedback provided by PRIME, they could then develop training activities designed specifically to remediate identified known performance deficiencies. For example, if the PRIME data identified certain tanks not engaging targets

because of target detection problems they could schedule such additional training for those tank crews. Likewise, if they found that certain tank platoon leaders were not providing proper sectors of fire for the tanks during the battle runs, they could schedule additional training for them. This ability to schedule training designed to meet identified training needs was considered extremely important to the commanders. As one commander reported, "I went to PRIME, looked and listened, and found out there were things we were not doing and needed to fix...It showed me things that I couldn't have found out any other way no matter what I could have done."

Gunnery and tactical training

The commanders indicated that PRIME could serve both gunnery and tactical training at the platoon and possibly company/team levels. In terms of tank gunnery, they reported that PRIME, with or without TWGSS/PGS, could be used prior to Table VII to prepare them for Table VIII qualification. Specifically, they felt that the TSV tapes provided in conjunction with PRIME could be used to determine whether the gunners were properly scanning for targets, tracking acquired targets, laying the reticle onto the target's center of visible mass, and responding correctly to tank commander fire commands. Similarly, they could determine whether tank commanders were identifying targets, issuing proper fire commands, and correctly handing-off targets to their gunners for engagement.

In terms of platoon tactical training, the commanders indicated that PRIME could be used prior to Table XII qualification. They reported that even though they were not able to train their tank platoons on more than one or two battle runs at the PRIME site, many of the platoons demonstrated tactical deficiencies that they were unaware of before training using PRIME. For example, one commander stated that all of his tanks were "killer" tanks based on Table VIII performance. Based on performance printouts provided at PRIME, however, he found out that only two of his tanks were really his "killer" tanks. As a result, he repositioned those two tanks within the platoon for Table XII qualification. Another commander reported that his platoon leaders thought they were capable of commanding and controlling their tank platoons during a battle run. However, by simply listening to the audio portion of the TSV tapes, they quickly learned that they were not qualified and had to quit "fighting their tank" if the platoon was to successfully accomplish its objective.

The commanders also reported that by using PRIME they discovered that their platoon leaders were not issuing proper platoon fire commands, not providing spot reports when engaged or complete situation reports following an engagement, not commanding or controlling their tanks during maneuver from one battle position to another, not assigning sectors of fire during the battle run, and generally failing to control radio communications. As one commander stated, "the command and control problems we had at PRIME were the same problems we had on Table XII." Even though they were able to correct some of the tactical deficiencies identified based on their performance at PRIME, the commanders indicated that their tank platoons were not ready for Table XII qualification. What they said they needed was more training time using PRIME.

Performance evaluation

Most of the commanders reported that PRIME could be used late in the gunnery cycle for evaluating tank platoons and tank crews as part of an overall training strategy. Several commanders suggested establishing performance "gates" using PRIME for advancing units to live fire qualification tables. As one commander reported, "Maybe we were doing it wrong. Maybe the idea should have been that a platoon goes out and proves itself on Phantom Run and then they get the bullets to go out and do a Table XII."

Summary and Conclusions

Eight tank company commanders were interviewed to determine which tasks from the units METL could be trained using PRIME, what changes or enhancements are needed to improve PRIME, and where PRIME could fit into the units overall training strategy. The commanders reported that except for resupply, all of the other eight platoon tactical operations can be trained using PRIME directly or in conjunction with PRIME. In terms of changes or enhancements needed to improve PRIME, the commanders reported that they needed: (a) a reliable, functional system; (b) training on the system; (c) unit training packages; (d) prepared, proofed scenarios; (e) summarized feedback; (f) assistance in preparing AARs; and (g) the time and mileage to train. In terms of where PRIME could be fit into the units overall training strategy, the commanders indicated that PRIME could be used: (a) as a diagnostic tool to identify individual, crew, and platoon gunnery and tactical deficiencies; (b) for training both tank gunnery and platoon tactics; and (c) as a "gate" test prior to live fire qualification.

In conclusion, the company commanders considered PRIME to have great potential for diagnostic testing, training, and evaluating tank platoon gunnery and tactics. Commanders were certain, however, that some things had to be changed before PRIME could meet this potential. The main function that had to be changed was on the system's reliability and the data provided to the commander for conducting the AAR.

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APPENDIX A: PRIME ENGINEERING CHANGE PROPOSALS/BLOCK MODIFICATIONS

PRIME ENGINEERING CHANGE PROPOSALS
(INSTALL 17-18 APR 89)

1a. Physical Verification of target function (i.e., target physically up or target physically down).

1b. User programmable time delay for Hoffman fire upon target presentation (target up).

1c. Elimination of 6 volt battery in modified LTID (i.e., provide power to LTID directly from ATTS).

2a. M2/M3 25mm firing requires at least three (3) hits on the target before the start of the probability of kill routine.

2b. Addition of eight (8) threat vehicles (i.e. BTR-60, BRT-70, BRDM, BRDM-2, BMP-2, ZSU-23/4, RPG Team and Infantry Squad).

PRIME BLOCK MODIFICATION I

OPERATIONAL UPGRADES
(INSTALL 17-18 APR 89)

1. SUPPORT REQUIREMENTS FOR CUSTOMER TEST. Provide on site installation/deinstallation assistance and PRIME component troubleshooting and fault component identification. Support is required for a two month period as follows:

a. Two 3 day periods of 10 hrs per day by 2 personnel.

b. One 14 day period of 18 hrs per day by 2 personnel.

c. One 10 day period of 18 hrs per day by 2 personnel.

2. "DRAWABLE" TARGET PRESENTATION AREAS. Ability to delimit a jagged-edge target presentation area around each target to include intervisibility dead-space and special target presentation requirements (target presentation after vehicular passes target, e.g., required for rear engagement). An interim solution will be done first which will be part of the final solution. The cost of the interim solution will be a part of the total cost of the final solution, i.e., cost of interim plus work for final solution equals one price for both. Modification of software for computer sub-system will be required. NOTE: Interim Solution see Item 9.

3. MANUAL/AUTOMATIC SYSTEM CHECKOUT STATION FOR PRIME AND MILES. Modification of existing MRAD to confirm MILES laser boresighting and correction direction required. Confirmation of PRIME coding. Recommended incorporation into 150 meter boresighting panel for Bradleys and M1s (i.e., mounts to back of panel and replaces ballistic crosshair). Battery operated with visual signal (strobe or other means) to indicate accurate boresight.

4. LITD BELT MODIFICATION TO ALLOW PLACING LITD SENSORS ON REAR OF T-72 TARGET FOR REAR ENGAGEMENT. Increase spacing between sensors 4-6, add 1 or more sensors to belt to allow for greater vulnerability for rear engagements.

PRIME BLOCK MODIFICATION II

OPERATIONAL UPGRADES
(INSTALL IN JUL AND NOV 89) (Two stage delivery)

1. BUILT IN TEST TO VERIFY POWER ON/LOW VOLTAGE OF ALL COMPONENTS. LEDs or other method to visually indicate that power is on and if batteries should be replaced because of low voltage.

2. ELIMINATE LORAN TRANSCEIVER BATTERY PACK. Eliminate separate battery requirement for LORAN transceiver.

3. GRAPHIC DISPLAY OF COURSE, ENGAGEMENTS, TERRAIN AND VEHICLE MOVEMENT NEAR REAL TIME TO INCLUDE TARGET FUNCTION CONFIRMATION AND VEHICLE STATUS. Partial or complete graphics display of course, vehicle position and targetry function. Ability to archive and replay after completion of run. Lines drawn between paired firing vehicle and target. Ability to stop action and restart. Vehicles identified by bumper number, targets by type and number (16T72). This will be a modification to the computer sub-system.

4. "DRAWABLE" TARGET PRESENTATION AREAS. Ability to delimit a jagged-edge target presentation area around each target to include intervisibility deadspace and special target presentation requirements (target presentation after vehicular passes target e.g., required for rear engagement). NOTE: Final solution.

5. CAPABILITY OF PRIME EQUIPPED VEHICLE TO FUNCTION AS LIVE TARGET IN TARGETRY ARRAY. Ability of PRIME equipped vehicle to function as live target to give crews defensive experience against moving vehicles, to allow moving target engagements, and vehicle-to-vehicle interaction without target vehicle activating PRIME equipped targets.

6. ABILITY FOR TARGETS TO REMAIN UP AFTER BEING HIT AND AFTER BEING KILLED. TARGETS STILL RECORD HITS FOR MONTE CARLO ROUTINE BUT REMAIN UP UNTIL SCENARIO COMMANDS TARGETS DOWN. Real "targets" do not sink into the ground after being hit/killed. Targets that go down after hit/kill uncomplicate the platoon leader's fire direction commands and platoon fire distribution requirements. As targets go down, remaining fire is directed towards remaining targets.

7. IMPROVE PRIME ANTENNA DURABILITY AND ADD SAFETY END TO LORAN ANTENNA. Shield or protect PRIME vehicular antenna base to prevent antenna shearing from tree or object strikes. Add eye protector end to LORAN stainless steel antenna end. (Possible magnetic base)?

8. EXECUTIVE "STOP" FUNCTION AND "MANUAL" CONTROL OF TARGETRY FOR TABLE VIII AND XII (4 VEHICLES) ENGAGEMENT REQUIREMENTS. Targetry control software capable of being stopped and started by executive command with engagement results archived for AAR printout. Ability to command presentation of targets when vehicle/s is/are at a certain location/s to meet fixed location

requirements of table VIII and XII engagements. Run as separate program on PRIME called Crew Proficiency Course (CPC).

9. ABILITY TO "FREEZE" A RUN AND RESTART. Capability to "freeze" a run in progress to allow for safety stops, critiques, troubleshooting, etc., and to restart the run from the point where it was "frozen." Engagement results before and after "freeze" archived for AAR printout.

10. RANGE READINGS ARCHIVED. Modify software to allow replay of scenarios and saving of essential data for AAR printout. Specifically range from firing vehicle to targets.

11. HIT, KILL AND NEAR MISS SELECTION CAPABILITY FOR SHOOTBACK. Ability to command, in scenario set up, the degree of shootback accuracy desired (probabilistic near miss, hit, or kill) to allow spectrum of return engagement difficulty. Pk will be range dependent by type of target.

12. ABILITY TO DEPLETE TARGETS FOR DEFENSIVE SCENARIOS. When targets are arrayed in threat arrays (two or more "bands") and presented most distant band up first, then closer bands, to simulate movement towards friendly defensive positions. The ability to delete targets in successive bands that have been killed in previous engagements.

13. MENU HELP SCREENS. During scenario set up and operational commands (AAR report generation) the ability to have help screens that describe instructions that may be used. Includes menu screens for DBASE III Plus to format selected reports for AAR, and menu screens for RCC operation.

14. SECURITY CAPABILITY. Each external component shall have a security ring (hardened and blind fastened) to allow cable or chain security.

15. OPERATOR'S MANUAL REVISION: Revise operator's manual based upon the above changes.

FUTURE (3 PRIMES)
(RETROFIT TO HOOD AS APPLICABLE)

1. ABILITY TO PLAY DISMOUNTED INFANTRY. (M2). Instrumented Infantry targets and dismounting infantry from BFV to play the same as vehicles (M1/M2/M3) and targets. Data collection and AAR requirements are the same for dismounted infantry players and infantry targets (shootback, etc) as for vehicular and target interface as they exist on PRIME. (Retrofit)

2. INTERFACE FOR M31 INFANTRY TARGETS. PRIME control of infantry target arrays (3-M31 for ATM team and 7 for infantry squad) that allows gang or selectable presentation (3 targets up/dowm followed by three different up/down, 5 up, all seven up) with capability to determine if individual targets were hit (total hits for ATM team or infantry squad), i.e., do not need to know which target was hit, only total hits per array. (Retrofit)

3. INCREASED QUANTITIES OF PRIME COMPONENTS. (Retrofit)

   a. 60 target sets

   b. 2 moving target sets (PRIME vehicular sets)

vehicular sets (includes two sets above if interchangeable)

UE. Target kill signal that can be used to indicate that hit "killed." Maybe Hoffman charge or other "kill" indication.

LLATION TIME AND TROUBLE SHOOTING TIME. Greater use of quick st locks, velcro and other mechanical methods to reduce lation time, e.g., wingnuts where bolts are required, affixed h lanyards; color coded cable connections, etc.). Diagnostic ponent confirmation of operation with self diagnostic capabil- cation of faulty component, or function.

HER WEAPON SYSTEMS INTO PRIME. Provide hardware and software of other direct fire weapons systems into PRIME (e.g., Improved ound TOW, DRAGON, AT4, M16 machine gun (SAWE?), APACHE HELL- t)

) CASES. NATO Mil-Std rack cases with covers, stackable, closed, storage drawers, pull out keyboards, and space for . Allows for portability and security of components and movement to another location.

ABLES. Male and female cable ends uniquely color coded to t connections and to decrease installation/deinstallation time to connect/disconnect label to prevent inadvertent pulling to nnect/remove).

REQUENCIES. Ability to change operational frequencies to other encies based on availability of local frequency allocations, able; programmable; or other method)?

APPENDIX B: PLATOON OPERATIONS DATA TABULATION FORM

PLATOON OPERATIONS	PRIME TRAINING		
	CAN	WITH	CANNOT
Conduct a Tactical Road March			
Conduct a Deliberate/Hasty Defense			
Conduct a Passage of Lines, Rearward			
Conduct a Passage of Lines, Forward			
Conduct a Movement to Contact			
Conduct a Hasty Attack			
Occupy an Assembly Area			
Conduct a Deliberate Attack			
Conduct Resupply			

MAJOR ISSUES/CONCERNS:

APPENDIX C: COMPANY MISSION ESSENTIAL TASK LIST (METL)

1. Prepare for combat operations.

    a. Perform pre-combat checks.
    b. Conduct intelligence preparation of the battlefield (IPB).
    c. Perform orders process.
    d. Conduct liaison activities.

2. Conduct tactical movement.

    a. Conduct tactical road march (day/night).
    b. Refuel on the move (ROM).
    c. Protect the force.
    d. Occupy attack positions.
    e. Execute company battle formations/ movement techniques.

3. Deploy the force.

    a. Prepare movement plan.
    b. Conduct mobilization training.
    c. Move to ports of embarkation.

4. Draw POMCUS

    a. Establish advance party teams.
    b. Draw vehicles, equipment and supplies.

5. Occupy staging areas.

    a. Prepare for movement to staging area.
    b. Occupy assembly areas.
    c. Conduct security operations.
    d. Task organize.

6. Conduct offensive operations.

    a. Conduct passage of lines.
    b. Conduct movement to contact.
    c. Conduct hasty attack.
    d. Conduct deliberate attack.
    e. Conduct river crossing.
    f. Conduct military operations on urban terrain.
    g. Conduct actions on the objective.
    h. Utilize and plan indirect fires.
    i. breach obstacles.

7. Synchronize combat power.

    a. Develop command and control process.
    b. Coordinate with higher, adjacent and supporting units.
    c. Integrate CS and CSS activities.

8. Sustain the force.

   a. Refuel/rearm/feed in combat environment.
   b. Evacuate and process WIA/KIA.
   c. Recover and evacuate damaged equipment.

9. Conduct defensive operations.

   a. Conduct NBC operations (decontamination, detection, unmasking and masking procedures).
   b. Emplace an obstacle.
   c. Conduct a counterattack.
   d. Occupy a battle position.
   e. Conduct a delay in sector.
   f. Conduct counter-reconnaissance operations.

APPENDIX D: COMPUTER PRINTOUT FOR AFTER-ACTION REVIEW

PHANTOM RUN
PLATOON BATTLE DRILL
_____ SCENARIO

(Enter which scenario is being run e.g., M1 platoon, day, #1
Recommend minimum of 2 scenarios per type platoon per day or night.)

ENGAGEMENT	VEHICLE 1	VEHICLE 2	VEHICLE 3	VEHICLE 4
	Bumper #			
	(FRIENDLY KILLED?)	(KILLED)	(KILLED)	(KILLED)
1	# TGTS/HITS/KILLS	T/H/K	T/H/K	T/H/K

(Tells whether friendly vehicle was destroyed by enemy "shoot back" capability)

START TIME

(NAUTICAL CLOCK TIME TARGETS POP UP)

(ENTER ONLY TARGETS HIT OR KILLED)

2
START TIME

TOTALS (# TGTS HIT/ #TGTS KILLED)

(GROSS MEASURE OF PLATOON COMBAT EFFECTIVENESS)

TOTAL HITS/ TOTAL KILL

TOTAL TARGETS PRESENTED: _____
TOTAL TGT HITS/KILLS/# TGTS ENGAGED BY THE PLATOON: ___/___/___
AVG POP-UP TO HIT/KILL TIME FOR ALL TGTS ENGAGED: _____
TGTS NOT ENGAGED/ACQUIRED: _____

(Used to help evaluate acquisition skill.)

(Used to evaluate how quickly platoon engages once targets are acquired.)

Q: How do we address multiple hits and/or kills?
How quickly does "enemy" shoot back?
Do we modify PK to 1 for first run?

INTENT: Identify the killers and those who do not shoot.
Focus on specific problem areas: (C^2, reporting, movement, scanning, target acquisition, MILES gunnery).

WHAT WE WOULD LIKE TO HAVE ON COMPUTER PRINT OUT

1. Hits and misses by vehicles and target numbers engaged.

2. Beginning and ending times for engagements.

3. Target exposure time/target engagement time.

4. Troop target activation and kill/deactivation.

5. Number of rounds fired per vehicle.

6. Number of hits per vehicle, on what target.

7. How many rounds vehicle fired in relationship with number of hits. (Refer back to #1 and #2)

8. Time that takes to destroy targets. Once target receives initial hit.

APPENDIX E: AFTER-ACTION REVIEW FORMATS

The PRIME printout is an important source of data for conducting the After-Action Review (AAR). The primary function of the printout is to allow participants to review the events occurring during the training scenario. Depending on how the information is formatted the printouts can be used by platoon leaders to obtain a summary of their platoon's performance for identifying training deficiencies or by crews to determine the reasons for their success or failure in engaging targets. In addition, information on the PRIME printouts may be used to locate events in time on the TSV tapes or on a planned Computer-Generated Video (CGV) map display. The categories of information that must minimally be included on the computer printouts are listed and defined below. The formats will combine different categories of information for different purposes. The measures within each category may be organized differently, depending on how the information is to be used, and the data within each category may be summarized to provide additional information.

Information Category	Definition
Time Tag	The point in time that the event or effect occurred
Firer	The identity of the vehicle or target that simulates weapon firing
Veh #	A bumper number that uniquely identifies each crew undergoing training
Tgt #	A number that uniquely identifies each target. Targets presented at the same time should be labeled to indicate multiple target presentation (e.g., Tgt 7a, 7b, 7c)
T Type	The type of target (e.g., T72, BMP) engaged
Range	The range (in meters) from the firer to the vehicle or target receiving the fire
Ammo	The type of ammunition used by the vehicle in engaging the target
Rnds	The number of rounds fired for a single event
T Event	An event that affects a target
V Event	An event that affects a vehicle
F Time	The time (in seconds) elapsing between presentation of a target and when it is fired on
FB Time	The time (in seconds) elapsing between presentation of a target when it fires back at a vehicle
V Status	The condition of a vehicle as the result of an event

T Status	The condition of a target as the result of an event
Miss	A round fired that registers no effect on any target
N Miss	A round that comes close enough to a target to register a near miss
Hit	A round that hits an alive target so that it no longer is a threat. A target that has been killed may remain "Up" but cannot return fire

Computer Printout Presentation. The following formats are suggested for presenting performance measures to the vehicle crews undergoing training. Minimally the crews should have access to each of the formats listed below via a menu. Additional formats may be needed depending on the training objectives of the units using PRIME for training. The capability to print the formats or call up a format for display on the CRT should be available at the After-Action Review facility. Data Base III commands such as SORT, INDEX, DISPLAY, and FIND can be used to locate and organize data in different formats. Other Data Base III commands (e.g., COUNT FOR) can be used to calculate the summary measures. The capabilities of Data Base III to compile summary measures was an important consideration in organizing the performance data into different formats and in structuring each format. Three measures, Range, Fire Time, and Fire Back Time, must be computed from other measures. Target range is derived from the UTM coordinates of the vehicle and target, while fire time and fire back time are calculated from target presentation time and time of firing. These measures should be calculated by Data Base III and included in the AAR formats.

Displaying AAR formats on the CRT has some advantages over using paper printouts, particularly if the design of the AAR facility allows the AAR facilitator and the crews to interact with the data base by calling up formats and scrolling through their contents. Time is saved by not having to print records for each crew, the platoon leader and the AAR facilitator before conducting the AAR. The amount of paper generated by a single platoon would be considerable and when that is multiplied for a company or battalion size unit, the volume of paper becomes enormous. Presenting the performance data on the CRT using the formats listed below allows the participants to view a coherent block of information in a form that allows data items to be located quickly. The items can then be used as points of discussion for the AAR or as indices for locating additional information on the TSV or OGV records. The added capability of directly accessing the TSV or OGV records from the CRT display would be very useful. During the AAR, data would be retrieved in a selected AAR format and displayed on the CRT. Pointing to or highlighting a row of data and pressing ENTER would cause the corresponding TSV recording to appear on the CRT via the time tag that is common to all formats. Pressing ENTER a second time would cause the corresponding OGV record to appear and pressing ENTER a third time would return to the original printed format. The computer would search the TSV tape or OGV records to find the appropriate time tag and begin playback at that point. With a dual or split screen arrangement the TSV and OGV recording could be viewed simultaneously. Careful consideration should be given to how simultaneous viewing of these records (via a dual or split screen arrangement) would help or hinder learning before designing this feature into PRIME.

Formats that can be used in conducting After-Action Reviews are shown below. Four different formats are described: (1) the marksmanship format; (2) the vehicle vulnerability format; (3) the firing events formats; (4) the weapons and target selection format. These formats are named according to the type of feedback that they provide. Each format description is accompanied by sample data that illustrates the format. The sample data for each format was selected to illustrate the kinds of information that are provided for that particular format. Therefore the exemplar data are not always consistent from one format to the next. The four formats show the organization of data that are generated by the PRIME computer. The final section in this paper is entitled Tactical Maneuver and Survivability. This section specifies features that will be needed in a computer generated video (CGV) map display in order to provide feedback on tactical movement as it relates to crew survivability.

Marksmanship Format. Information about the speed and accuracy of gunnery performance is captured in the marksmanship format. This format provides speed and accuracy measures for each firing event. It can be used in conjunction with the Ammo/Weapon Selection format, the Ammo Conservation format, and the TSV recording to pinpoint the reasons for good or poor gunnery performance. Marksmanship information can be organized in at least two ways, by firing vehicle and by target being engaged. Whether organized by target or by firing vehicle, the information should be presented in chronological order for each vehicle or target. The "By Vehicle" organization would be the obvious choice for use with TSV because the listing by vehicle parallels the individual videotape presentation for each vehicle. But the "By Target" organization is also useful because it shows each crew the effects that other vehicles had on the targets presented and shows the platoon leader which crews fired successfully and unsuccessfully at each target. For either organization, the platoon leader needs summary data for speed and accuracy measures. The average fire time, as well as the number of hits, near misses, and kills should be printed for each scenario. Misses are not listed in the target events category because the targets only sense rounds that strike the MILES sensors; therefore no effect is shown for cases where a crew misses the target by a large margin. In addition, the average fire time and number of kills should be printed for each vehicle in the "By Vehicle" listing. The number of targets presented, including the example below, Target 10 was presented but was not fired upon by any vehicle in the platoon. Because the marksmanship format presents only vehicle firing events, Target 10 does not appear in the listing of target events but it is counted for purposes of the summary.

Vulnerability Format. The vulnerability format provides information about a crew's or platoon's ability to detect targets quickly and to use terrain and fire power to avoid being killed. The vulnerability format is not a "vulnerability table" showing which targets are vulnerable to a particular ammunition or weapon. Rather, it shows which targets killed each vehicle, the elapsed time between presentation of the target and target fireback, and the range from which the vehicle was engaged. It also shows when "dead" vehicles are "resurrected" for further training. Vulnerability information is best organized "By Vehicle" so that it can be used with TSV to show crews what they were doing when they got killed. Events for each vehicle should be arranged in chronological order.

Markmanship Format

Time Tag D HH MM SS	Firer	Tgt #	Range	T Event	F Time
3 12 49 28	Gold 4	Tgt 6	1200	Hit	12.5
3 12 51 30	Gold 4	Tgt 8	1530	N Miss	8.2
3 12 51 44	Gold 4	Tgt 8	1500	Kill	22.2
3 12 55 32	Gold 2	Tgt 7	1640	Kill	9.1
3 13 20 24	Gold 2	Tgt 12	1700	----	12.4
3 13 25 10	Gold 3	Tgt 13	900	----	13.6

Summary: Targets Presented 6, No Effect 2, Near Misses 1, Hits 1, Kills 2, Mean Fire Time 13.0
By Vehicle Summary: Gold 4: Kills 1, Mean Fire Time 14.3
Gold 2: Kills 1, Mean Fire Time 10.8
Gold 3: Kills 0, Mean Fire Time 13.6

Vehicle Vulnerability Format

Time Tag D HH MM SS	Firer	Veh #	Range	V Event	V Status	FB Time
3 12 52 01		Tgt 7	Gold 4	1620	N Miss	Alive30
3 12 52 31		Tgt 7	Gold 4	1600	Kill	Dead35
3 13 00 00		----	Gold 4	----	Resurrect	Alive----
3 13 12 23		Tgt 10	Gold 2	1350	Kill	Dead35
3 13 19 20		-------	Gold 2	----	Resurrect	Alive----

Summary: Vehicles Missed 1, Vehicles Killed 2, Resurrections 2
Mean Fire Back Time 33.3

Firing Events Format. In order to get a more comprehensive picture of the firing events for both friendly vehicles and enemy targets, a firing events format can be used. The firing events format is a hybrid cross between the marksmanship and vehicle vulnerability formats. The advantage of this format is that it shows the interactive firing between vehicles and targets in chronological order. An important feature of this format is that those affecting targets, and all other events (e.g., target presentations, vehicle resurrections) are excluded. This format organizes information chronologically, but the information could also be organized by vehicle, with events for each vehicle sequenced chronologically.

Weapon & Target Selection Format. The function of this format is to provide crews feedback on their selection of ammunition and weapons for particular types of targets. It also shows the status of the target just before the firing event occurred, so that crews can determine if they are wasting rounds on targets that have already been killed. Weapon selection can be determined from the type of ammunition employed; this information, used in conjunction with target type and target range is valuable for identifying instances where the ammunition selected was inappropriate for the target, or the weapon was fired at a target beyond its effective range. For example, the COAX machine gun is effective out to 900 meters, and use of the COAX to engage the HIND Helicopter at 1520 meters resulted in a target miss. A "By Vehicle" organization of the data is recommended, with events for each vehicle listed in chronological order.

Firing Events Format

Time D HH MM SS	Firer	V Event/ T Event	Range	Veh #/ Tgt #	F Time	FB Time
3 12 49 28		Gold 4	T Hit	1200	Tgt 6	12.5----
3 12 51 30		Gold 4	T N Miss		1530	Tgt 8 8.2----
3 12 51 44		Gold 4	T Kill	1500	Tgt 8	22.2----
3 12 52 01		Tgt 7	V N Miss		1620	Gold 4----30
3 12 52 31		Tgt 7	V Kill	1600	Gold 4	----35
3 12 55 32		Gold 2	T Kill	1640	Tgt 7	9.1----
3 13 12 23		Tgt 10	V Kill	1350	Gold 2	----30
3 13 20 24		Gold 2	------	1700	Tgt 12	12.4----
3 13 25 10		Gold 3	------	900	Tgt 13	13.6----

T Summary: Targets Presented 6, No Effect 2, Near Misses 1, Hits 1, Kills 2, Mean Fire Time 13.0
V Summary: Vehicles Missed 1, Vehicles Killed 2
By Vehicle Summary: Gold 4: Kills 1, Mean Fire Time 14.3
Gold 2: Kills 1, Mean Fire Time 10.8
Gold 3: Kills 0, Mean Fire Time 13.6
Loss Exchange Ratio (Targets Killed/Vehicles Killed): 1.0

This format may also be used to determine the efficiency of ammunition use in killing targets. For each firing event the number of rounds, ammunition type, and effect of the rounds on the target are printed. All firing events are listed, including those in which the round completely misses the target (i.e., a bolo round). In the exemplar format below, target 12 was not affected because it had already been killed, and the round fired at target 13 did not come close enough to register a Near Miss. The summary lists the number of rounds fired for each weapon type and a measure of killing efficiency in terms of rounds used per target killed. According to FM 17-12, 20 to 30 COAX machine gun round bursts or 10 to 15 CAL .50 machine gun bursts should be fired at point or area targets. Therefore for calculating killing efficiency a 30-round COAX machine gun burst will be counted as equivalent to one main gun round. Rounds per target killed will be rounded to the nearest whole number.

Weapon and Target Selection Format

Time Tag D HH MM SS	Firer	T	Tgt # Status	T	Range Type	Ammo	Rnds	T Event
3 12 49 27		Gold 4	Alive	Tgt 6	T72	1200	SABOT	1Hit
3 12 51 26		Gold 4	Alive	Tgt 8	Hind	1520	COAX	28N Miss
3 12 51 50		Gold 4	Alive	Tgt 8	Hind	1500	HEAT	1Kill
3 12 55 31		Gold 2	Alive	Tgt 7	BMP	1640	SABOT	1Kill
3 13 20 24		Gold 2	Dead	Tgt 12	BMP	1700	HEAT	1----
3 13 25 10		Gold 3	Alive	Tgt 13	T72	900	SABOT	1----

Tgt & Weapon Selection Summary: Number of dead targets engaged 1 Targets engaged beyond effective range of weapon 1
Ammo Summary: SABOT 3 COAX 28 HEAT 2 RNDS/TGTKILL 6/2
Ammo Summary (By Vehicle): Gold 4, RNDS/TGT KILL 3/1
Gold 2, RNDS/TGT KILL 2/1
Gold 3, RNDS/TGT KILL 1/0

Platoon Marksmanship Grand Summary. For purposes of a quick overview of the marksmanship exhibited by the crews in the platoon, some units may desire a breakdown of engagement outcomes by crew. The platoon leader might use this to identify the "killer crews", crews that fired but missed, and crews that did not fire. Caution is advised in using the grand summary data in this manner because some crews may have had more opportunities to engage targets than others due to vehicle position at the time of target presentation or other factors. A particularly fast crew may engage most of the targets before others in the platoon are able to fire a round. This may mask the ability of slower crews to effectively neutralize targets. Emphasis on "killer crews" may foster an atmosphere of competiveness that is counterproductive to effective platoon operations. The purpose of the AAR is to provide feedback that leads to improved platoon the performances of individual crews without analyzing the actions and behaviors that led to those performances is a poor training technique.

The grand summary may provide useful information to the platoon leader or AAR facilitatior. It shows the number of rounds fired relative to the number of misses, near misses, hits, and kills. It also lists the targets presented and indicates which targets were killed. This data may assist the AAR facilitator in selecting target engagements for review during the AAR. A particularly good performance by one or more crews in engaging a set of linked (multiple) targets could be identified quickly from this format and looked at more closely with TSV or CGV recordings. Targets that were presented but not killed suggest poor platoon performance and may be used identify engagements where the platoon performed poorly.

Platoon Marksmanship Grand Summary

Firer	Rnds	Misses	Near Misses	Hits	Kills	Tgts Killed
Gold 1	0	0	0	0	0	NA
Gold 2	2	1	0	0	1	#7
Gold 3	1	1	0	0	0	NA
Gold 4	3	0	1	1	1	#8
Summary:	6	2	1	1	2	#7,#8

Targets Presented: #6, #7, #8, #10, #12, #13

Tactical Maneuver and Survivability. The range monitoring system should provide data on tactical maneuver and survivability once it is in place. A computer generated video (CGV) is planned for displaying maneuver patterns across the range in real time using map graphics. To display maneuver patterns, PRIME must track the path of each vehicle across the maneuver range. One way this might be accomplished is to have the vehicles report their location via LORAL position location equipment as often as every 2 or 3 seconds to the range control computer. Less frequent vehicle location reporting intervals (e.g. once every 20 to 30 seconds) may used if the result is an acceptable visual presentation. Vehicle location would also be reported whenever there is a firing event. The location of other vehicles as well as the location of the target should be displayed when the vehicle engages the target or is engaged by the target. The display should differentiate between vehicle firing events and target firing events. Targets should not appear until they are activated and should show the effects of being hit or killed.

Vehicles likewise should show the effects of target firings and vehicles that were unscathed by enemy fire. Fast forward, rewind, and freeze frame capabilities are an absolute must in order to use CGV in the After-Action Review.

The CGV map display should also provide information about intervisibility between vehicles and targets at the same rate as vehicle location information is reported. Targets should only appear on the map display when they have intervisibility with one or more vehicles. Vehicle icons should change colors when they are concealed and do not have intervisibility with any targets in the target presentation area. Kills should be assessed only when the intervisibility condition is satisfied. A vehicle emerging from a concealed position (i.e., intervisibility deadspace) should have a grace period of several seconds before the vehicle is vulnerable to the effects of target fire. If one vehicle is visible and another is hidden, only the visible vehicle may engage the target or be engaged by the target.

The usefulness of the CGV in the AAR will vary in direct proportion to the features that it includes. A careful review of other map display systems (e.g., SIMNET plan view display) and other tactical engagement devices (e.g., TACTS) should be completed before designing the PRIME CGV. The design of features that appear on the map as well as flexibility in determining which features appear for different training purposes will be critical to using the CGV in the AAR. For example, using icon color to indicate the use of cover and concealment provides feedback on to crews about their use of terrain. Flexibility to vary the design of the map format prior to the executing the training scenario is critical. Features such as contours, grid lines, alternate map scales, vehicle heading, vehicle speed, gun tube direction, and numerical representation of UTM coordinates may or may not be needed, depending on the training application and training objectives. Minimally the CGV should show vehicles, targets, key terrain features such as hazards or obstacles, time tags, and vehicle-target pairings for all firing events. The identity and location of targets and vehicles should also be shown. Different icons should be sued to represent different vehicle and target types, and the icons should change as a function of intervisibility and vehicle or target status.

Another useful feature would be an overlay that shows the planned platoon movement routes as described in the Operations Order (OPORD). This feature would allow platoon leaders to see how their OPORD influenced subsequent events and to evaluate crews on how well they followed the planned movement routes. A feature that permits the evaluation of fire distribution would also be useful. This feature would show each vehicle's sector of responsibility as defined in the OPORD, along with the line of fire, each time a vehicle engaged a target. The line of fire and the sector of responsibility should remain on the map display long enough (5 to 10 seconds) to detect the firing event and to pause the CGV to discuss the event.

APPENDIX F: PHANTOM RUN AAR PROCEDURES

1. AARs are a critical part of training, and through preparation is crucial to an effective AAR. Phantom Run provides several objective instruments which facilitate preparation and conduct of the AAR. However, the very presence of these multiple sources makes preparation difficult.

2. To maximize training time you must quickly prepare your AAR within 15 minutes. Few commanders could move onto the range and prepare a thorough AAR without a basic framework to follow. The framework listed below establishes responsibilities for providing objective and subjective input to the AAR, a timeline for their preparation and submission, and general outline for the AAR. By following this process and involving the command team of your XO, 1SG and master gunner you will efficiently prepare and conduct the AAR.

3. Host Unit Responsibilities

a. Immediately after occupying the range, and issuing the OPORD, company commander will brief you on the facilities available in the AAR van. Pay particular attention to the map overlays for each engagement and how to synchronize the video cassette players. He will then lead you through a reconnaissance of the range pointing out control measures (battle positions, phase lines, check points) and trajectory. All of this will take approximately one hour.

b. Simultaneously the host master gunner will instruct your company master gunner in how to read and interpret the printouts from the computer. While you may use only a small portion of the information available on the printouts for the AAR, your master gunner can use them later to help identify individual crew and systematic training deficiencies in gunnery proficiency. Think of the printouts as a source of information similar to that found in UCOFT summaries. We recommend you and your master gunner select one or two good and poor engagements to use in the AAR and that you not try to review every engagement in the AAR. In addition, key data you may want to address in your AAR are as follows:

* Which crew(s) kill, which shot and missed, and which did not shoot as all?
* Number of targets presented.
* Number of targets hit or killed.
* Number of targets near missed.
* One good and one bad engagement to facilitate platoon/crew self criticism of performance.

The tower NCOIC will mark the summary printouts with the information listed above recommending which engagements to use in the AAR. You and your master gunner may use these or select others. The tower offers a good vantage point to observe most of the engagements, of the day runs. The tower NCO will add any subjective comments he might have to the bottom of the printout. These comments may be useful in the preparation of your AAR.

c. The host unit master gunner and your master gunner can monitor the platoon and company nets in the TOC. Together they can record their observation of the platoon run. Should you decide to place your master gunner in the

tower or take him with you, our master gunner will record his subjective observations and pass them to you at the AAR van.

Note: If the trips are not working the two master gunners will follow the plt down the course. They help the Cdr prepare his AAR, and quickly follow the next plt.

d. The soldier responsible for the AAR van will assist you in synchronizing all of the individual thru-site video tapes to the same engagement. He will also start the VCR which records your AAR. Copies of this tape are available if you provide your own blank tape.

4. Firing Unit Responsibilities. The training on this range is for you and your platoons. You must learn the facilities available on the range and understand the scenario. After you guide each platoon through the battle run, you prepare the AAR. This range and the facilities are here for you to use to prepare your company for Table XII, and we all want each of your platoons to qualify.

5. Timeline. The timeline below list the sequence of events without specific times. When your company arrives on the range and how quickly the first platoon is prepared for the battle run will determine just how soon you can begin.

Inbrief. Host briefs company commander and platoon leaders in 1-5 TOC behind AAR van.

Opord. Company commander issues warning order and OPORD to the platoon leaders (GP medium with sand table provided).

Preparation. Company commander and XO go on tour of RAA facility and reconnaissance of the range. Company master gunner and 1SG are briefed by host unit master gunner. Platoons prepare for combat.

Battle Run. 1st platoon conducts battle run--company commander evaluates.

Battle Run and AAR. 2nd Platoon conducts battle run--company XO evaluates. Company commander prepares and conducts AAR with assistance from master gunner.

Battle Run and AAR. 3rd Platoon conducts battle run--company commander evaluates. XO prepares and conducts AAR with assistance from 1SG.

The timeline above is very general in nature. The following paragraph lists a recommended method for preparing and conducting the AAR.

6. AAR.

a. Input.

- Camera crew takes video of crossing LD to AAR van. AAR van NCO loads all tapes. EOM + 15 min.

- Tower NCO provides "marked up" computer printouts. EOM + 20 min.

- Host master gunner provides observations to firing unit master gunner/1SG and reviews printouts with them. EOM + 30 min.

- Firing unit master gunner briefs company commander on summary data and recommends representative engagements to use in AAR. EOM + 40 min.

- Host company commander assists with preparation of AAR materials. Firing unit commander providing AAR briefing cards on operating system and AAR Agenda. EOM + 40 min.

b. Conduct of AAR - AAR Agenda

- State training objectives - Co Cdr/XO

- State mission and concept - Plt Ldr

  * Scheme of maneuver
  * Plt SOP
  * Overwatch

- Two +'s and two -'s - platoon
  (what was good and not so good, self critique)

- Review of "not so good" engagement - Co Cdr/MG

- Review of "good" engagement - Co Cdr/MG

- Review of the operating systems - Co Cdr (3X5 cards, company commander and others observations).

- Summary
  * Targets presented
  * Targets hit
  * "Killers" identified.
  * What areas need improvement?
  * What areas did platoon do well?

7. NOTES
   a. Try to limit AAR to 25-35 minutes.
   b. Do not critique more than 3 events - 1 good and 2 bad.
   c. AAR is not a critique of entire performance.
   d. Get all of the platoon into discussion.

PERFORM TACTICAL PLANNING

DETERMINES PLATOON MISSION

DEVELOPS AND SELECTS BEST COURSE OF ACTION

ISSUES WARNORD, OPORD & FRAGO

COMMAND AND CONTROL

EXECUTE A HASTY ATTACK

INSURES MANUEVER ELEMENT IS OVERWATCHED

ATTACKS FLANK OF OPFOR POSN

MANEUVER

PERFORM PLATOON LEADERS RECON

CONDUCTS MAP RECON

ANALYZES OCOKA BY MAP AND GROUND RECON

INTELLIGENCE

PERFORM TACTICAL ROADMARCH

ORIENTS WEAPONS FOR 360 DEG SECURITY

AIR GUARDS AND SECURITY UP

MANEUVER/AIR DEFENSE

DISPLACE TO A SUBSEQUENT BP

MOVING ELEMENTS OVERWATCHED AT ALL TIMES

PLT COVERS MOVE WITH SMOKE INDIRECT FIRES

MANEUVER/FIRE SUPPORT

PERFORM SURVEILLANCE ACTIVITIES

PLATOON USES STANDARD VISUAL SEARCH TECHNIQUES

INTELLIGENCE

CONDUCT NBC OPERATIONS

PLATOON MAINTAINS MOPP 4

PLATOON SUBMITS NBC REPORTS

PLATOON REMAINS BUTTONED UP

MOBILITY/COUNTERMOBILITY/SURVIV

ESTABLISH ALL AROUND MOVE SECURITY

PLT USES WINGMAN CONCEPT

MOVEMENT TECHNIQUE APPROPRIATE TO CURRENT METT-T

INTELLIGENCE

PERFORM PLT FIRE CONTROL & DIST

ROUTE, MOVE TECHNIQUE, AND SECTORS SPECIFIED BY OPORD OR SOP

PLATOON DESTROYS ALL TARGETS

COMMAND & CONTROL/FIRE SUPPT

ESTABLISH PERIMETER SECURITY

PLT LEADER DESIGNATES POSITIONS TO COVER 360 DEG PERIMETER

PLT ESTABLISHES OBS POSTS

INTELLIGENCE

PROVIDE C^2 OF PLT

ALL PERSONNEL INFORMED OF MISSION

COMMAND AND CONTROL

OCCUPPY A BATTLE POSN

RANGE CARDS SKETCHED IN 20 MINS

RECONS SUBS BP,TO INCLUDE ROUTE

VEHICLES IN HIDE POSNS AND CAMO'D IN 30 MINS

INTELLIGENCE

PERFORM ASSEMBLY AREA ACTIVITES

EMPHASIZES MAINTENANCE THAT CAN'T BE DONE IN COMBAT

BORESIGHTS AND ZEROES

INSURES RELOADS OF CLASS III & V

COMMAND AND CONTROL

BREACH AN OBSTACLE

USES OVERWATCH FOR BREACH TEAM

SECURES NEAR AND FAR SIDE

REPORTS LOCATION, CONDITION AND COMPLETION

MOBILITY/COUNTERMOBILITY

EXECUTE ACTIONS ON CONTACT

PLT RETURNS FIRE

PLT DEPLOYS

PLT REPORTS

PLT DEVELOPS SITUATION WITH FIRE AND MANEUVER

COMMAND AND CONTROL

PERFORM CONSOLIDATION/REORG

PLT ESTABLISHES SECURITY

ELIMINATES REMAINING OPFOR

REGAINS CONTACT/CONTROL WITH ALL ELEMENTS

COMMAND AND CONTROL

GLOSSARY

AC . . . . . Active Component

AARs . . . . . After-Action Reviews

ARI . . . . . Army Research Institute

ARTEP . . . . . Army Training and Evaluation Program

ATTS . . . . . Automatic Tank Target System

BLK Mods . . . . Block Modifications

CG . . . . . Commanding General

CY . . . . . Calendar Year

CAC . . . . . Combined Arms Center

CMTC . . . . . Combat Maneuver Training Center

CTDR . . . . . Commercial Training Device Requirement

DOTD . . . . . Directorate of Training and Doctrine

ECPs . . . . . Engineering Change Proposals

FM . . . . . Field Manual

FDT&E . . . . . Force Development Test and Experimentation

HQ . . . . . Headquarters

HumRRO . . . . . Human Resources Research Organization

IPR . . . . . In-process Review

I-MILES . . . . Instrumented Multiple Integrated Laser Engagement System

km . . . . . Kilometer

LTID . . . . . Laser Target Interface Device

MOA . . . . . Memorandum of Agreement

MTA . . . . . Major Training Area

MTP . . . . . Mission Training Plan

METL . . . . . Mission Essential Task List

MILES . . . . . Multiple Integrated Laser Engagement System

PM TRADE . . . . Project Manager for Training Devices

PRIME. . . . . Precision Range Integrated Maneuver Exercise

RC . . . . . Reserve Component

RCC . . . . . Range Control Computer

STXs . . . . . Situational Training Exercises

TAS . . . . . Technical Advisory Service

TCPC . . . . . Tank Crew Proficiency Course

TDA . . . . . Table of Distribution and Allowances

TDS . . . . . Training Device Study

TPA . . . . . Target Presentation Area

TSV . . . . . Thru-the-sight Video

TEXCOM . . . . . Training and Experimentation Command

TRADOC . . . . . Training and Doctrine Command

TWGSS/PGS. . . . Tank Weapon Gunnery Simulator System/Precision Gunnery System

USAIS . . . . . U.S. Army Infantry School

USAARMS. . . . . U.S. Army Armor School

USAREUR. . . . . U.S. Army Europe

USATSC . . . . . U.S. Army Training Support Center

UTM. . . . . Universal Transverse Mercator

VCR . . . . . Video Cassette Recorder